ESA-071 Alabama River Newsprint Public Report

1. Introduction:

   This plant produces approximately 270,000 tonnes/year of newsprint paper which is shipped as rolls sized to customer specifications. Raw materials include pine logs which yield 70% of pulp and 30% recycled newsprint. Operations for virgin pulp include debarking of logs, chip washing, fiber refining in a "thermo-mechanical" operation, fiber separation, followed by dewatering to form paper. Recycled material undergoes a variation of the virgin pulp process. High pressure superheated steam is produced in several boilers at a neighboring plant (Alabama River Pulp, ARP). At this facility, steam is passed through turbines from which the moderately superheated exhaust steam is de-superheated to about 170 psig. and 370^{o}F before being piped to the ARN facility which pays for this delivered steam on the basis of continuous flowmetering. At the ARN plant, steam is directed to a large outdoor pressurized-water-filled accumulator from which it is flashed to supply processes at 55 psig or is pressure-reduced to 35 psig and 20 psig for use in process equipment. The major use for steam in the plant is for paper drying in an extensive steam-heated roller system. The steam system at ARN does not utilize any steam turbines and no electricity is produced on-site.

2. Objective of ESA:

   The objective of this ESA was twofold:
   a) To train company/plant personnel in the use of the DOE Steam Tool software.
   b) To perform a "training assessment" of plant equipment and processes leading to the recommendation of measures for achieving substantial plant energy savings.

3. Focus for Assessment:

   The ESA focused on the plant-wide use of purchased steam with an emphasis on the reduction in steam consumption and cost. The associated reduction in steam use at the ARN plant will result in reduced boiler fuel purchases (including natural gas and #4 fuel oil).

4. Approach for ESA:

   The ESA Expert worked directly and continuously on-site with the Plant Lead (Ruffing), the thermo-mechanical pulping leader (Chavous) and the Environmental Manager (Copeland). Additional plant personnel including the General Manager (Backus) and several other specialists joined the core group discussions at various times. Following an initial plant inspection (including a visit to the ARP facility), the Expert guided group discussions of plant processes using steam and the use of SSAT for simulating steam system performance. The core group then identified a set of twelve proposed steam-reduction measures. Technical data needed to evaluate these measures were obtained from plant records, measurements in the plant and in discussions with several plant personnel having knowledge of specific plant operations. The Expert and the core plant personnel group then used SSAT to evaluate the proposed projects to arrive at a final list of six quantified recommendations.

5. General Observations of Potential Opportunities:

   a) Purchased energy annual consumption and cost:

      Steam
      Consumption (2005 Purchases): 507,380,020 lbs./yr. (approximate energy content of purchased steam: 507,380 x 10^6 BTU/yr.; approximate energy content of ARP equivalent natural gas energy: 634,225 x 10^6 Btu/yr.)
      Cost: $3,224,407 ($6.30/10^6 BTU)

      Electricity
      Consumption (2005): 744,000,000 kWh/yr.
      Cost: $37,000,000 ($0.05/kWh)

   b) SSST Results:

      Raw scoring including response to boiler and condensate return questions:

      Steam system profiling: 25/90 pts. = 28%
      Steam system operating practices: 62/140 pts. = 44%
      Boiler plant operating practices: 0/80 pts. = 0%
      Distribution, end use, recovery, operating practices: 16/30 pts. = 53%
      Overall score: 103/340 pts. = 30%

      Scoring excluding non-applicable boiler and condensate-related questions:

      Steam system profiling: 25/40 pts. = 63% (DOE database plants: 59%)
      Steam system operating practices: 62/100 pts. = 62% (DOE database plants: 74%)
      Boiler plant operating practices (not applicable) (DOE database plants: 62%
      Distribution, end use, recovery, operating practices: 16/20 pts. = 80% (DOE database plants: 54%)
      Overall score: 103/160 pts. = 64% (DOE database plants: 66%)

6. Energy Saving Opportunities:

1. Install a HP to LP steam turbine to generate electricity on-site:

Currently, a neighboring plant (ARP) produces high pressure steam from several wood waste fuels and purchased fuel oil (#4) and natural gas to supply on-site turbine generators. Turbine exhaust steam is used locally (about 90%) with about 10% of steam produced (170 psig, 370 ^{o}F) being supplied to ARN. The ARP plant reportedly can supply substantially more steam than the amount currently utilized. Furthermore, the ARP plant currently de-superheats the initially produced superheated steam which could be supplied in a superheated condition for optimal turbine operation at the ARN plant. (**Medium-term opportunity;** potential ARP purchased natural gas saving: -6%; purchased electricity saving: 1.5%)

2. Install extended nip shoe paper drying system:

Installation of a state-of-the-art extended nip shoe paper drying system would allow more water removal from paper before passage over the array of steam-heated drums. This would allow a substantial increase in production rate and a moderate decrease in the use of steam to achieve the final paper moisture condition. The extended nip shoe system would be substantially costly and would be cost-justified mainly on the basis of a significantly increased paper production rate. The related steam energy cost reduction would contribute to positive project economics. (**Long-term opportunity**; potential ARP natural gas savings: 3.5%)

3. Insulate process components:

A plant inspection revealed that the steam distribution lines are very well insulated. However, several pieces of large process equipment operated at substantially elevated temperatures are not insulated to a high degree. A plant survey resulted in the finding of the following lightly-insulated equipment (with process temperatures indicated): 3 latency chests (195^{o}F), refine reject chest (>200^{o}F) and the white-water chest (175^{o}F). All of these pieces of equipment are physically large with large surface areas for which added insulation would substantially reduce radiation and convection heat loss to plant space. (**Medium-term opportunity**; potential ARP natural gas savings: 1.1%)

1. Reduce space heating of finished goods warehouse:

Reportedly, the finished goods warehouse is maintained at about 72^{o}F during the winter heating season even when access doors are open for substantial periods. It is recommended to issue transport equipment workers jackets and gloves so that the controlled space temperature can be reduced to no more than 60^{o}F to achieve substantial energy savings for the large warehouse area. (**Near-term opportunity**; potential ARP natural gas savings: 1.4%)

5. Insulate ends of paper drying drums:

   Forty-seven large steam-heated drums are used to dry paper passed over the rotating drum surfaces. The circular drum ends (approximately 15 ft^2 each) are hot but do not contact paper and loose heat by radiation and convection to plant air continuously. Commercially available "snap-on" insulation disks can be installed on the heated drum ends to minimize this loss (**Near-term opportunity**; potential ARP natural gas savings: 0.3%)

6. Implement a steam trap maintenance program

   Reportedly, the last comprehensive survey of plant steam traps was completed about four years ago (in 2002). Based on industrial data imbedded in SSAT, a substantial energy saving (due mainly to the elimination of "blowing through" traps) would result from the institution of a high quality steam trap maintenance program. It is recommended that an experienced outside vendor be employed to set-up a steam trap maintenance program and to test and repair (as needed) traps on an annual basis. (**Near-term opportunity**; potential ARP natural gas savings: 0.2%)

Summary of potential (ARP natural gas) savings:

Near-term measures: 8,447 x 10^6 Btu/yr.
Medium-term measures: -41,631 x 10^6 Btu/yr.
Long-term measures: 30,586 x 106 Btu/yr.

7. Management Support and Comments:

   The plant General Manager arranged for the plant process engineer, a highly-experienced process operator and the environmental manager to work continuously with the ESA Expert over a three-day period to clarify plant operations and concerns and to assist in the formulation of energy-saving measures for further consideration. Additionally, several plant process operators participated in discussion sessions to clarify plant procedures and to supply data needed for project analysis. Plant management personnel were highly supportive of the ESA and rated the value of the assessment as substantially useful in guiding energy conservation and associated cost reduction actions.

8. DOE Contacts at plant/company

   Plant Contacts:

   Allison Ruffing, Process Engineer: P.O. Box 10, Perdue Hill, AL 36470, (251) 743-6407, Allison_Ruffing@abitibiconsolidated.com

   Jay Backus, General Manager, P.O. Box 10, Perdue Hill, AL 36470, (251) 743-6430, jay_backus@abitibiconsolidated.com